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United States
Department Of
Agriculture

Forest
Service

Shasta-Trinity
National Forests

Reply To: 3420

Date: January 25, 1990

Subject: Evaluation of Red Fir Mortality on McCloud RD, Shasta-Trinity NFs
(Report No. N90-2)

To: Forest Supervisor, Shasta-Trinity NFs

Bill Branham, Silviculturist on the McCloud RD, noticed a high level of red fir mortality near the Mud Creek drainage and requested an evaluation of the situation. The area was examined on December 14, 1989 by Dave Schultz and Gregg DeNitto from the Forest Pest Management Northern California Service Area, and Bill Branham and Bill McBain from the District.

The areas examined were on the southern slope of Mt. Shasta, generally near the Mud Creek drainage. Mortality was light and scattered up to about 5,000 feet elevation, which is approximately the lower edge of the distribution of red fir in the area. Above that level, red fir mortality was common as single trees or small groups. There did not appear to be any strong pattern to the mortality. Dead trees ranged in appearance from thrifty saplings to large, slow-growing trees. Stocking and competition around dead trees varied from fairly open to quite dense.

The dead fir trees were most commonly infested with the fir engraver, Scolytus ventralis, and the roundheaded fir borer, Tetropium abietis. There are generally few external signs of infestation by these beetles until crowns begin to fade. Infested trees may occasionally exhibit resin flows or boring dust in bark crevices. Resin drops and flows were quite common on the bark of green trees in the areas examined. Some of these trees had slightly off-color foliage. Examination of a few of these trees indicated that enough cambium was damaged to cause these trees to fade in the spring of 1990. Other trees with resin on the bark had more normal appearing foliage. Attacks on these trees were generally unsuccessful and they should survive if precipitation is adequate this winter.

The major underlying factor responsible for the current mortality is low winter precipitation for the past 3 years. Moisture stress has allowed numerous successful attacks by the fir engraver and roundheaded fir borer. These insects require a full year to complete their life cycle. Fir trees are attacked in July or August and normally don't fade until the following spring. It would be difficult to accurately determine the number of fir trees that will fade during the spring of 1990, even if each tree in the area was examined individually. A conservative way of estimating the number of trees that will fade is to assume that because precipitation has been consistently low for the past several years, approximately the same number of trees will fade in the spring of 1990 as there were in 1989. If precipitation this winter is normal, or above normal, it should result in fewer successful attacks this summer and fewer fading fir trees





in 1991. Past situations involving drought-induced fir mortality have generally taken more than one year for mortality to return to normal levels.

There are no actions that could be taken at this time to cause mortality to return to normal. Commercial salvage of the dead and dying fir trees can recover some of the value of the wood, but is unlikely to remove enough beetles to have any effect on mortality. Thinning the stands would probably result in lower future mortality but the effects would not be expected for a year or two. A full range of stocking levels was not examined, so the level that results in little or no mortality is not known. Observations of current fir mortality in a number of locations, and results of thinning studies in other species suggest that a stocking level that would result in no mortality under drought conditions would be too low to fully utilize the site under normal conditions. In those areas where it is feasible to do commercial thinning in fir, total production would probably be optimized by retaining dominants and co-dominants while reducing stocking to 70-80 percent of normal. Any plans for thinning in the near future should anticipate elevated levels of mortality in 1990 and probably also in 1991.

Tree mortality is becoming more apparent in the true fir forests around Mt. Shasta. This situation is similar to other parts of the state which have also had low precipitation. Additional red trees will show up as the weather warms. The Forest could consider initiating a public education effort to alert visitors and local residents to current forest conditions, and expectations of what will occur. These efforts could help to dispel rumors and myths about why tree mortality levels are high. They could also limit the efforts of various publics to encourage the Forest to take drastic actions. Education efforts could also be aimed at informing the public of increased salvage around Mt. Shasta and other parts of the Forest, if such activities are planned.

Management Alternatives

1. Do Nothing. Fir mortality will remain elevated for at least another year or two. Some trees will fade during the spring after precipitation returns to normal because they were attacked during the preceding summer. Tree vigor will not respond immediately after soil moisture has returned to normal and a few insect attacks will still be successful. The situation will eventually stabilize and mortality will return to normal levels. The dead fir trees will deteriorate within a few years. Most stands should still have enough live basal area to be considered stocked, although there may be some openings in the stands.
2. Salvage Dead and Dying Trees. This alternative will not reduce further mortality but will recover some of the value of the dead trees. If salvage operations cause much damage to roots or boles of green trees, mortality will probably increase. Otherwise, the prognosis is the same as the Do Nothing alternative.
3. Thin Stands. Unless drought conditions persist, thinning in the next year or two will not reduce the number of trees that are going to die due to this drought. It may also be difficult to make effective selections for leave trees at this point because the stands contain infested trees which are difficult to detect based on external symptoms. The purpose of thinning would be to improve future growth and vigor, and reduce future mortality. Fir stands thinned to





stocking levels suitable for commercial timber production will still have scattered mortality during drought periods, but to a much lower degree than the current situation.

If you need further assistance, or would like to discuss the alternatives presented in this evaluation, please call Dave Schultz or Gregg DeNitto at 916-246-5087.

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